PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-275599
(43)Date of publication of application : 08.10.1999

(51)Int.Cl. H04N 9/73
H04N 9/07
H04N 9/68

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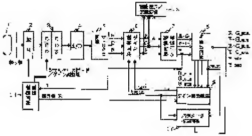
(30)Priority
Priority number : 10 8051 Priority date : 19.01.1998 Priority country : JP

(54) WHITE BALANCE CONTROLLER



(57)Abstract:
PROBLEM TO BE SOLVED: To realize a white balance controller where a white level is detected with high accuracy with a white level detection means with a simple configuration to hardly cause malfunction due to the effect of a chromatic object.
SOLUTION: A white level detection circuit 8 discriminates whether or not a luminance signal Y and color difference signals R-G, B-G are included in a luminance range and a color difference range depending on a white level detection parameter from a parameter arithmetic circuit 10 through comparison arithmetic operation and provides outputs of a count of pixels discriminated to be white level pixels and integrated values of R, G, B values. Again detection circuit 9 decides the R, G gain based on the count and the R, G, B integrated values and sets the result to a gain adjustment circuit 6. The parameter arithmetic circuit 10 sets the white level detection parameter based on the R, B

gain and the count.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to a digital still camera provided with the imaging system which used the CCD image sensor etc., a digital camcorder, and the white balance control apparatus in other image input apparatus.
[0002]
[Description of the Prior Art]The white balance control apparatus of the image input apparatus which used the CCD image sensor etc. for the imaging system amends the tone change of output signals, such as a CCD image sensor by the color temperature of a light source, that there is no sense of incongruity in human being's eyes, and is a function indispensable to the digital still camera using a CCD image sensor etc., etc.
[0003]Conventionally, a white balance control apparatus is divided roughly and the thing of two methods is used. One is an external measurement method which forms an external color temperature sensor apart from an imaging system, and amends the color tone of an imaging system according to the detect output. Another is a TTL (Through TheLens) method which calculates the correction amount of a color tone using the sexual desire news of the picture captured by the imaging system. This TTL system can be divided roughly into the full screen average method which amends total of all the color differences of an image pick to 0 according to a rule of thumb, and the white detection method which extracts a white field out of a picture and amends the color difference of that portion to 0. It is concerned with the white balance control apparatus of this white detection method in this invention.
Therefore, the conventional white detection method is described hereafter.

[0004]As a white detection method, the luminosity Y, color difference Cr (=R-Y) of sexual desire news of a pixel, If the value which calculated and calculated the value of Cr/Y and Cb/Y using the value of Cb (=B-Y) is contained in the fixed range in alignment with the black-body-radiation characteristic curve on Cb/Y-Cr/Y coordinate, the conventional example which judges the pixel to be white is indicated to JP,2-26193,A.
[0005]That is, from Y and Cr which are obtained from a CCD image sensor, and Cb value, if Cr/Y and a Cb/Y value are calculated, the value to the pixel of the color same on Cb/Y-Cr/Y coordinate will become settled in about 1 mind. The characteristic in alignment with the black body radiation of the object by the color temperature of the light source in connection with white balance control appears as a curve as shown in drawing 1 on Cb/Y-Cr/Y coordinate. Therefore, the field which shows Cr/Y near this curve and a Cb/Y value has a high possibility of being white. Paying attention to this point, by the above-mentioned conventional example like the shading portion shown in drawing 1 in an image pick, Cr/Y contained to the field surrounding [four straight lines] a black-body-radiation characteristic curve and the field which shows a Cb/Y value are detected as a white region, and white balance adjustment is performed by carrying out color correction so that the color difference of this field may be set to 0.
[0006]In the above-mentioned conventional example, when a white region does not exist on an image pick, white detection conditions are eased, and a correction amount is calculated using the sexual desire news of the whole picture, but excessive amendment is kept from starting to a chromatic color photographic subject by adding restriction to a correction amount in this case.
[0007]
[Problem(s) to be Solved by the Invention]In the above-mentioned conventional example, since Cr/Y and Cb/Y which are not based on the luminosity of image data but serve as a fixed value are used to the white photographic subject, there is an advantage whose error produced by carrying out the erroneous decision of the deep-colored chromatic color photographic subject with low luminosity to white decreases. However, also when the circuit for carrying out the operation which is needed for every pixel for white detection and the judgment of an operation value of Cr/Y and Cb/Y becomes complicated and it carries it out by the software processing using a microprocessor, there is a problem that processing takes time. When a white photographic subject and the chromatic color photographic subject of the color near which beige black-body-radiation characteristic are intermingled as a problem in connection with the principle of white detection, there is a problem that the erroneous decision also of the fields other than white is carried out to white, and they produce an error in the above-mentioned conventional example.
[0008]This invention is what was made in view of the problem of conventional technology which was mentioned above, If the purposes are enumerated, hardware for white detection processing can be realized simply and cheaply, and the software processing of white detection processing also provides the white balance control apparatus of easy composition, The white balance control apparatus with which the malfunction under the influence of a chromatic color photographic subject does not take place easily is provided, The white balance control apparatus of the composition which can update a white detection range is provided accommodative to the white balance established state of the image input apparatus applied, Also when sufficient white detection cannot be performed in first time exposure, it is ** to provide the white balance

control apparatus which can reduce the sense of incongruity of initial screens, such as a monitor display of a picture, etc.
[0009]
[Means for Solving the Problem]In order to attain said purpose, a white balance control apparatus by the invention according to claim 1, White detection parameter Y_min, Y_max which can be set [picture / which was captured by an image sensor] up from the exterior, As opposed to R-G_min, R-G_max, B-G_min, and B-G_max, A pixel with the luminosity Y and color difference R-G which fulfill conditions of Y_min<Y<Y_max, R-G_min<R-G<R-G_max, and B-G_min<B-G<B-G_max, and B-G is detected, Counted value of a detected pixel and R, G, and a white detection means to output an integrated value of B value, Counted value outputted from this white detection means and R, G, and a gain detection means to determine and output R gain value and B gain value for a white balance based on B value integrated value, It is the composition of providing a gain-adjustment means to adjust a profit of R data of a picture, and B data with R gain value and B gain value which were outputted from this gain detection means.
[0010]A white balance control apparatus by the invention according to claim 2, It adds to composition of a white balance control apparatus by the invention according to claim 1, Based on R and G which were outputted from a white detection means, B value integrated value, and counted value, It is the composition further provided with a parameter computation means which determines white detection parameter Y_min for a picture captured by exposure next time, Y_max, R-G_min, R-G_max, B-G_min, and B-G_max, and is set as this white detection means.
[0011]A white balance control apparatus by the invention according to claim 3, In composition of a white balance control apparatus by the invention according to claim 2, A parameter computation means shifts parameter Y_min of a luminance range in a white detection parameter, and Y_max to the high-intensity side, when counted value exceeds a count threshold set up beforehand, When counted value is less than a count threshold, it is the composition which shifts parameter Y_min of a luminance range, and Y_max to the low-intensity side.
[0012]A white balance control apparatus by the invention according to claim 4, In composition of a white balance control apparatus by the invention according to claim 3, As a parameter computation means narrows a color difference range, so that a luminance range becomes low-intensity, and a color difference range is extended, so that a luminance range becomes high-intensity, it is the composition of determining parameter R-G_min of a color difference range, R-G_max, B-G_min, and B-G_max.
[0013]In composition of a white balance control apparatus by the invention according to claim 3, the white balance control apparatus according to claim 5 is the composition of reversing a shift direction of a luminance range, when a parameter computation means is shifted to a luminosity maximum to which a luminance range was set beforehand, or a luminosity minimum.
[0014]A white balance control apparatus by the invention according to claim 6, In composition of a white balance control apparatus by the invention according to claim 1, When counted value to which a gain detection means is outputted from a white detection means to a picture of first time exposure is less than a threshold set up beforehand, R gain value and B gain value for indoor light color temperature which were beforehand set up when an exposure value which shows a luminosity of a photographic subject outputted

from an exposure control means of a picture input device was below an indoor type threshold set up beforehand are outputted, When it is beyond an outdoor type threshold to which this exposure value was set beforehand, it is the composition which outputs R gain value and B gain value for outdoor light color temperatures which were set up beforehand.

[0015]A white balance control apparatus by the invention according to claim 7, In composition of a white balance control apparatus by the invention according to claim 2, When R gain value and B gain value of a parameter computation means which were outputted from a gain detection means are larger than a reference value set up beforehand, Only a value proportional to R gain value or B gain value makes a value of parameter R-G_min of a color difference range in a white detection parameter, R-G_max, B-G_min, and B-G_max increase, When R gain value and B gain value are smaller than a reference value set up beforehand, they are parameter R-G_min of a color difference range, R-G_max, B-G_min, and the composition that only a value proportional to R gain value or B gain value decreases a value of B-G_max.

[0016]To the invention according to claim 8, a ** white balance control apparatus, In composition of a white balance control apparatus by the invention according to claim 1, A gain detection means changes R and G which were outputted from a white detection means, B value integrated value R_sum, G_sum, B_sum, and counted value into average value of Mg-G normalized to 1-pixel data, When not fulfilling conditions of Mg-G_min<Mg-G<Mg-G_max from the outside to threshold Mg-G_min and Mg-G_max which are set up, it is the composition which outputs R gain value and B gain value which were determined last time.

[0017]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described with reference to an accompanying drawing.

[0018]Drawing 2 shows one example of the white balance control apparatus of this invention applied to the digital still camera by which the CCD image sensor was used for the imaging system, the digital camcorder, etc.

[0019]In drawing 2, an optical lens and 2 extract 1 and 3 is a unit of a CCD image sensor and a CDS (correlation double sampling) circuit. The input light which passed along the lens 1 enters into the CCD image sensor of the unit 3, after having light volume adjusted by the diaphragm 2, it is changed into an electrical signal, and is outputted as a picture signal from the CDS circuit of the unit 3. The diaphragm 2 adjusts incident light quantity according to the diaphragm value set up by the exposure control circuit 11, and the CCD image sensor and CDS circuit of the unit 3 adjust a light exposure according to the shutter speed and the gain-adjustment value which are set up by the exposure control circuit 11.

[0020]4 is an A/D converter and changes into a digital data signal the picture signal outputted from the CDS circuit of the unit 3. 5 is a matrix circuit, changes into R of each pixel, G, and B value the image data digitized by A/D converter 4, and inputs it into a gain-adjustment circuit. This gain-adjustment circuit 6 carries out the multiplication of the coefficient decided by the gain value set as the R value inputted from the matrix circuit 5, and B value from the gain detector circuit 9, adjusts the profit of R data and B data, and outputs R and G by which white balance adjustment was made, and B value. 12 is image display/recorder, outputs R after white balance adjustment, G, and B data to TV monitor etc., applying a gamma correction, or writes in and saves them in the memory for

image recording.

[0021]The portions explained above are fundamental component part, such as a digital still camera. The portion directly in connection with white balance control, It is the above-mentioned gain-adjustment circuit 6 as a gain-adjustment means in the evaluation data conversion circuit 7 as an evaluation data conversion method, the white detection circuit 8 as a white detection means, the gain detector circuit 9 as a gain detection means, the parameter arithmetic circuit 10 as a parameter computation means, and it. In this example, the exposure control circuit 11 as an exposure control means is also related to white balance control.

[0022]The evaluation data conversion circuit 7 outputs the data of the luminosity Y, color difference R-G, and B-G by the gain-adjustment circuit 6 by considering R after a gain adjustment, G, and B data as an input. The luminosity Y is called for by approximate expressions, such as Y=0.3R+0.6G+0.1B. The exposure control circuit 11 inputs an exposure value into the gain detector circuit 9 while it sets up a diaphragm value to the diaphragm 2 and sets up shutter speed and a gain-adjustment value to the CCD image sensor of the unit 3 by calculating the optimal light exposure based on this luminosity Y data.

[0023]R-G and B-G which input the white detection circuit 8 from the evaluation data conversion circuit 7, and Y data, Parameter Y_min of a luminance range inputted as a white detection parameter from the parameter arithmetic circuit 10, Y_max, parameter R-G_min of the color difference range, R-G_max and B-G_min, and based on the value of B-G_max, The data of the field equivalent to white is detected out of image data. As a decision criterion of whether the data of each pixel is equivalent to white, the following conditional expression R-G_min<R-G<R-G_max, B-G_min<B-G<B-G_max, and Y_min<Y<Y_max are used. The white detection circuit 8 integrates R of the pixel of the detected white, G, and B value while it detects the pixel of the white which fills the above-mentioned conditional expression and counts the number. Supposing the picture captured by the CCD image sensor of the unit 3 here is field read-out, The detection processing of a white pixel and processing of the addition of the count of the detected pixel and R, G, and B value are repeated to the image data of the 1st whole (or the appointed field) field of each frame. After processing finishes to the 1 field, the white detection circuit 8 outputs counted value count of the detected pixel, R of the detected pixel, G and integrated value R_sum of B value, G_sum, and B_sum.

[0024]Thus, since the white detection circuit 8 is the composition of a simple comparison operation performing white detection and performing count of the detected pixel, and addition of R, B, and G value, it is realizable by simple and cheap hardware. Although processing time starts most as for the white detection processing for all the pixels of a picture and high speed processing is required, if it is the simple contents of processing which were described above, high speed execution is easily possible by the software processing using a microprocessor etc. Therefore, the means equivalent to the white detection circuit 8 is easily realizable also with software.

[0025]Although processing of the white detection circuit 8 described above is performed at the 1st field period of each frame, the gain detection processing, the operation of the white detection parameter by the parameter arithmetic circuit 10, and setting out by the gain detector circuit 9 described below are performed at the 2nd field period of each frame.

[0026]Based on the exposure value outputted from the output value and the exposure control circuit 11 of the white detection circuit 8, the gain detector circuit 9 calculates R gain value rgain and B gain value bgain, and sets it up to the gain-adjustment circuit 6. This R and B gain value are inputted also into the parameter arithmetic circuit 10. An example of the concrete composition of the gain detector circuit 9 is later mentioned in relation to drawing 3.
[0027]The parameter arithmetic circuit 10 based on counted value count inputted from R inputted from the gain detector circuit 9, B gain value rgain, bgain, and the white detection circuit 8, The value of the white detection parameter to exposure, i.e., R-G_min, R-G_max, B-G_min, B-G_max, Y_max, and Y_min are calculated next time, and it is outputted to the white detection circuit 8. An example of the concrete composition of this parameter arithmetic circuit 10 is later mentioned in relation to drawing 5.
[0028]An example of the internal configuration of the gain detector circuit 9 is shown in drawing 3. In drawing 3, 13 is a normalizing circuit and normalizes R, G, B integrated value R_sum, G_sum, B_sum, and counted value count to r, g, and b value by the operation of r=R_sum/countg=G_sum/countb=B_sum/count.
[0029]However, when counted value count is less than the count threshold set up from the exterior, the normalizing circuit 13 does not perform the above-mentioned normalized arithmetic, namely, does not update r, g, and b value, but r and g which were calculated by the last exposure, and b value are held. Since white balance adjustment may become unstably or unsuitable when the white detection data of a picture with not much few white regions is used for the determination of R and B gain value, this is for avoiding it.
[0030]When counted value count is less than a count threshold and r, g, and b value are not become final and conclusive at the time of first-time exposure, the normalizing circuit 13, Compare the exposure value which shows the luminosity of the photographic subject outputted from the exposure control circuit 11 with the indoor type threshold and outdoor type threshold which were set up beforehand, and when an exposure value is below an indoor type threshold, r, g, and b value are set as an indoor type fixed value (r and g which were beforehand prepared for the color temperatures of indoor light, b value), and when another side and an exposure value are beyond an outdoor type threshold, r, g, and b value are set as an outdoor type fixed value (r and g which were beforehand prepared for the color temperatures of outdoor light, b value). When it is a photographic subject in which white detection is impossible in first time exposure, the purpose of performing such control, It is for performing white balance control of an indoor type to the photographic subject under a dark light source, performing white balance control of the outdoor type to the photographic subject under a bright light source, and reducing the sense of incongruity of initial screens, such as a monitor display.
[0031]r and g which are outputted from the normalizing circuit 13, and b value are inputted into the Mg-G decision circuit 14 and the gain arithmetic circuit 15. The Mg-G decision circuit 14 changes into a Mg-G value r and g which were inputted, and b value by the operation of Mg-G=r+b-2xg. And it judges whether as compared with Mg-G_min and Mg-G_max which are the Mg-G thresholds which can be set up from the exterior, the conditions of Mg-G_min<Mg-G<Mg-G_max are fulfilled in this Mg-G value, and the truth of that decision result and the Mg-G decision result of the binary which shows an imitation are outputted. Here, as Mg-G_min of a Mg-G threshold and the value of Mg-

G_max are shown in drawing 4, all the coordinates of the special light source which is a black-body-radiation characteristic curve of a color temperature control range and the target of white balance control of a fluorescent lamp etc. on color difference (R-G, B-G) coordinates are chosen as the value contained.

[0032]The gain arithmetic circuit 15 determines and outputs R for white balance adjustment, B gain value rgain, and bgain by the operation of rgain=g/rbgain=g/b from r and g which were inputted from the normalizing circuit 13, and b value, when a Mg-G decision result is "truth." However, when a Mg-G decision result is an "imitation", R, R which did not update B gain value but was calculated by the last exposure, B gain value rgain, and bgain are outputted.

[0033]Thus, by changing the detected information of the white detection circuit 8 into the average value of Mg-G normalized to 1-pixel data, and performing the threshold decision, controlling to repeal it and to use the last R and G gain value, when the white detection data shifted in the direction of Mg unrelated to color temperature change and the direction of G is outputted from the white detection circuit 8 -- the frequency of malfunction of white balance control can be reduced.

[0034]An example of the internal configuration of the parameter arithmetic circuit 10 is shown in drawing 5. R gain value rgain and bgain which 16 is a limiting circuit and are inputted from the gain detector circuit 9 in drawing 5, When rgain, a bgain upper limit threshold, or a lower limit threshold is exceeded, respectively, it clips in the upper limit threshold or lower limit threshold, otherwise, inputs into the white detection range arithmetic circuit 17 with an input value.

[0035]The white detection range arithmetic circuit 17 on a basis inputted R, B gain value rgain, and bgain by table conversion. Color difference reference-value r-g_max of the white detection parameter at the time of exposure, r-g_min, b-g_max, and b-g_min are calculated next time (refer to drawing 6), Furthermore, Y_max of the white detection parameter eventually set to the white detection circuit 8 next time at the time of exposure, Y_min, R-G_min, R-G_max, B-G_min, and B-G_max are outputted last time based on Y_max of the white detection parameter at the time of exposure, and the value of Y_min.

[0036]In the above-mentioned table conversion processing, inputted R, B gain value rgain, and bgain are changed into color difference reference-value r-g_max corresponding to a color temperature, r-g_min, b-g_max, and b-g_min. Namely, as shown in the table of drawing 9, when R, G gain value rgain, and bgain are the reference values defined beforehand. Make each color difference reference value into a reference value, and when R, G gain value rgain, and bgain are the maximums, Make each color difference reference value into the maximum, and when R, G gain value rgain, and bgain are the minimums, Each color difference reference value is made into the minimum, and when R, G gain value rgain, and bgain are between a reference value, the maximum, or the minimum, linear interpolation determines each color difference reference value. According to such conversion, the range of the color difference reference value on R-G corresponding to each color temperature and the color difference flat surface of B-G comes to be shown in drawing 6.

[0037]The upper left direction of a shaded region [in / in a color difference reference value / drawing 6] beforehand the table of drawing 9 to the minimum color temperature by the side of the low color temperature of a white balance control range by setting up so that lower right direction may serve as a value equivalent to the maximum color

temperature by the side of high color temperature, Even if the white balance of an input system changes, the physical relationship of a color difference reference value and the relative coordinates of a color temperature change characteristic is always fixable. In the whole region of the color temperature which is the target of white balance control, this is for obtaining equivalent white detection accuracy by fixing the color of a light source, and the relative position on the color difference flat surface of a white detection range. So that I may be understood from the below-mentioned explanation by the above-mentioned table conversion processing. When R inputted from the gain detector circuit 9, B gain value rgain, and bgain are larger than a reference value, It becomes a form where the value proportional to R and B gain value is added to R-G_min of a white detection parameter, R-G_max, B-G_min, and B-G_max, When R, B gain value rgain, and bgain are smaller than a reference value, it becomes a form where the value proportional to R, B gain value rgain, and bgain is subtracted from R-G_min of a white detection parameter, R-G_max, B-G_min, and B-G_max.
[0038]Next, parameter Y_max of the luminance range of the white detection parameter in the white detection range arithmetic circuit 17 and the deciding method of Y_min are described. When counted value count inputted from the white detection circuit 8 is usually larger than the count threshold set up beforehand, the white detection range arithmetic circuit 17, Y_max used last time at the time of exposure and a Y_min value are shifted to the high-intensity side in fixed quantity, and when counted value count is smaller than a count threshold, Y_max and a Y_min value are shifted to the low-intensity side in fixed quantity. In the white detection circuit 8, this adjusts parameter Y_min of the luminance range of a white detection parameter, and the value of Y_max so that the white region where luminosity is high if possible may be detected, Also when the chromatic color photographic subject of a color equivalent to color temperature change of a light source which causes malfunction, and a white photographic subject are intermingled, it is for detecting only a white object.
[0039]However, as a result of shifting the value of Y_max and Y_min, when a Y_max value reaches the high-intensity upper limit set up beforehand, the white detection range arithmetic circuit 17. Reverse the direction which shifts a Y_max value, it is made to shift to the low-intensity side, the direction which shifts a Y_min value when the low-intensity lower limit to which Y_min was set beforehand is reached is reversed, and it is made to shift to the high-intensity side. Counted value count continues being outputted by carrying out like this. Even if the purpose of such shift direction control is a photographic subject which cannot detect the field of high-intensity white, White detection is continued adjusting a luminance range until the white region where luminosity is the highest is detectable, When it enables it to perform a white balance using the color difference information of only the brightest white region within a picture and a white photographic subject and a chromatic color photographic subject with an equivalent color temperature change are intermingled, it is for making hard to be influenced influence by a chromatic color photographic subject, and reducing an error.
[0040]After parameter Y_max of the luminance range of the white detection parameter at the time of exposure and the value of Y_min are determined as mentioned above next time, the white detection range arithmetic circuit 17, Color difference reference-value r-g_max, r-g_min, b-g_max and b-g_min which were determined by the above-mentioned table conversion processing and Y_max, and based on the value of Y_min, It is a value of

color difference range parameter R-G_max of the white detection parameter at the time of exposure, R-G_min, B-G_max, and B-G_min next time Following computing equation
R-G_max=r-g_max*(Y_max-luminosity lower limit threshold)/(luminosity upper limit threshold-luminosity lower limit threshold)
B-G_max=b-g_max*(Y_max-luminosity lower limit threshold)/(luminosity upper limit threshold-luminosity lower limit threshold)
R-G_min=r-g_min*(Y_max-luminosity lower limit threshold)/(luminosity upper limit threshold-luminosity lower limit threshold)
B-G_min=b-g_min*(Y_max-luminosity lower limit threshold)/(luminosity upper limit threshold-luminosity lower limit threshold)
asking "be alike" -- these values -- the value of Y_min and Y_max -- it outputs to the white detection circuit 8 as a white detection parameter.
[0041]That is, on Y, R-G, and B-G coordinates, the color difference range comes to spread, so that narrowing and the luminosity Y become high in the color difference range, as the luminosity Y becomes low, so that Y_max and the white detection range corresponding to the value of Y_min may be illustrated to drawing 7. In the example of drawing 7, field each of rectangular corresponds to one exposure, and five kinds of Y_max and the white detection range to the combination of Y_min are shown. Thus, white detection parameter R-G_min, R-G_max, B-G_min, and B-G_max are set up in order for luminosity to enable distinction of a light-colored high photographic subject and a deep-colored photographic subject with low luminosity and to reduce an error, so that high-intensity may make the color difference range large and low-intensity may narrow it.
[0042]The white balance control apparatus of this example by synchronizing with the timing of exposure of a CCD image sensor, the 1st field read-out, and the 2nd field read-out the operation explained above, and performing it, as shown in drawing 8, Highly precise white balance control which followed color temperature change of a light source can be performed. The gain detector circuit 9 and the parameter arithmetic circuit 10 only process only once per 1 field using the integrated value and counted value of R, G, and B value which the white detection circuit 8 outputted, and can perform those processings at high speed enough by software using a microprocessor. Therefore, the means equivalent to the gain detector circuit 9 and the parameter arithmetic circuit 10 is easily realizable also by software.
[0043]
[Effect of the Invention]According to this invention, the following effects can be acquired so that clearly from the above explanation.
[0044]In the white balance control apparatus by the invention according to claim 1, since a white detection means is the composition of performing a simple comparison operation, count of a pixel, and addition of R, B, and G value, it is realizable by simple and cheap hardware. Although processing time starts most as for the white detection processing for all the pixels of a picture and high speed processing is required, If it is such simple contents of processing, high speed execution is easily possible by the software processing using a microprocessor etc., therefore the effect of ** that a white detection means is realizable can be easily acquired also by software processing using a microprocessor.
[0045]In the white balance control apparatus by the invention according to claim 2, The color difference range and luminance range for white detection can be arbitrarily set up

with a parameter, and effects, like it is possible to perform white balance control and it is can be acquired, updating a white detection range accommodative to the white balance established state of image input apparatus, such as a digital still camera.
[0046]In the white balance control apparatus by the invention according to claim 3, Adjusting the parameter of a luminance range is continued so that the white region where luminosity is high always if possible may be detected, Since a white object can be certainly detected also when the photographic subject of a color equivalent to color temperature change of a light source which causes malfunction, and a white photographic subject are intermingled in a picture, effects, like malfunction of white balance control cannot break out easily can be acquired.
[0047]In the white balance control apparatus by the invention according to claim 4, Since the color difference range is narrowed, so that the luminance range of white detection is low, and the color difference range is extended so that a luminance range is high, distinction of a photographic subject high luminosity and light-colored and a photographic subject low luminosity and deep-colored is attained, and effects, like malfunction of white balance control decreases can be acquired.
[0048]In the white balance control apparatus by the invention according to claim 5, White detection is performed adjusting a luminance range until the white region where luminosity is the highest is detectable, even if it is a photographic subject which cannot detect the field of high-intensity white, That white balance control carries out using the color difference information of the brightest white region within a picture can acquire the effect of being able to reduce the malfunction under the influence by a chromatic color photographic subject, when a white photographic subject and a chromatic color photographic subject with an equivalent color temperature change are intermingled for a ****** reason.
[0049]In the white balance control apparatus by the invention according to claim 6, By performing white balance control of an indoor type to the photographic subject under a dark light source, and performing white balance control of the outdoor type to the photographic subject under a bright light source, also when it is a photographic subject in which white detection is impossible in first time exposure, When the monitor display of the picture is carried out, the effect that the sense of incongruity of an initial screen is mitigable etc. can be acquired.
[0050]In the white balance control apparatus by the invention according to claim 7, Since the color of a light source and the relative position on the color difference flat surface of a white detection range are always fixed, white detection accuracy is equated in the range whole region of the color temperature which is the target of white balance control, and effects, like highly precise white balance control is attained can be acquired.
[0051]In the white balance control apparatus by the invention according to claim 8, when a white detection means outputs the value shifted in the direction of Mg unrelated to color temperature change, and the direction of G, the effect of being able to reduce malfunction of white balance control can be acquired by repealing it.

[Translation done.]